

What is claimed is:

1. A lens barrel structure, comprising:

a first lens frame including an outer ring portion,  
5 an inner ring portion, and a flange wall by which a front  
end of said outer ring portion and a front end of said  
inner ring portion are connected, said first lens frame  
being provided with a first cam follower on an inner  
peripheral surface of said outer ring portion;

10 a cam ring which is driven to rotate and positioned  
between said outer ring portion and said inner ring  
portion;

a second lens frame which includes a second cam  
follower, and is positioned inside said inner ring  
15 portion;

a first cam groove formed on an outer peripheral  
surface of said cam ring so that said first cam follower  
is engaged with said first cam groove;

a second cam groove formed on an inner peripheral  
20 surface of said cam ring so that said second cam follower  
is engaged with said second cam groove;

a linear guide ring, positioned around said first  
lens frame, for guiding said first lens frame linearly  
along an optical axis; and

25 a linear guide mechanism, provided between said

inner ring portion of said first lens frame and said second lens frame, for guiding said second lens frame linearly along said optical axis.

2. The lens barrel structure according to claim 1, wherein said linear guide mechanism comprises:

a linear guide slot formed on said second lens frame to be elongated in said optical axis direction; and

a linear guide projection which is elongated in said optical axis direction, and projects from an inner peripheral surface of said first lens frame to be engaged in said linear guide through-slot.

3. The lens barrel structure according to claim 1, further comprising a third lens frame positioned inside said first lens frame and behind said second lens frame, and

wherein a second linear guide mechanism is provided between said first lens frame and said third lens frame.

4. The lens barrel structure according to claim 3, wherein said second linear guide mechanism comprises:

a linear guide projection which is elongated in said optical axis direction, and projects from an inner peripheral surface of said first lens frame;

a groove which is formed on said linear guide projection to be elongated in said optical axis direction; and

a linear moving key which projects from said third  
5 lens frame to be engaged in said groove.

5. The lens barrel structure according to claim 1, further comprising a third lens frame positioned inside said first lens frame and behind said second lens frame, wherein a third linear guide mechanism is provided  
10 between said second lens frame and said third lens frame.

6. The lens barrel structure according to claim 5, wherein said third linear guide mechanism comprises:  
a linear guide slot formed on said second lens frame to be elongated in said optical axis direction;  
15 and

a linear guide projection which is elongated in said optical axis direction, and projects from said third lens frame to be engaged in said linear guide through-slot.

20 7. The lens barrel structure according to claim 6, wherein said first, second and third lens frames support a first, second and third lens group, respectively, said first, second and third lens groups constituting a zoom lens system.

25 8. The lens barrel structure according to claim

2, further comprising:

a third lens frame positioned inside said first lens frame and behind said second lens frame;

a groove formed on said linear guide projection  
5 to be elongated in said optical axis direction;

a linear moving key which projects from said third lens frame to be engaged in said groove; and

a second linear guide projection which is elongated in said optical axis direction,

10 wherein said linear guide slot comprises a linear guide through-slot,

wherein said second linear guide projection projects from said third lens frame to be engaged in said linear guide through-slot,

15 wherein said linear moving key projects from said second linear guide projection,

wherein said second linear guide projection is engaged in said linear guide through-slot from inside said second lens frame, and

20 wherein said linear guide projection is engaged in said linear guide through-slot from outside said second lens frame.

9. The lens barrel structure according to claim 4, wherein said groove is formed to have a substantially  
25 T-shaped cross section, and

wherein said linear guide key is formed to have a T-shaped cross section corresponding to said groove.

10. The lens barrel structure according to claim 1, further comprising a stationary barrel having  
5 a female helicoid formed on an inner peripheral surface of said stationary barrel,

wherein a male helicoid is formed on an outer peripheral surface of said cam ring to be engaged with said female helicoid, and

10 wherein a spur gear which is engaged with a drive pinion is formed on a thread of said male helicoid of said cam ring.

11. The lens barrel structure according to claim 1, further comprising:

15 an exterior ring which is positioned around said first lens frame, said exterior ring including a third cam follower; and

a third cam groove formed on an outer peripheral surface of said cam ring so that said third cam follower  
20 is engaged in said third cam groove.

12. The lens barrel structure according to claim 8, wherein said linear moving key projects from a front end of said second linear guide projection, and

wherein a rear end of said groove is closed so that  
25 the rear moving limit of said third lens frame relative

to said second lens frame is determined by contact of said linear moving key with said closed rear end of said groove.

13. A lens barrel structure, comprising:

5 a stationary barrel;

a linear guide ring which is fitted in said stationary barrel to be movable along an optical axis without rotating relative to said stationary barrel;

a first lens frame which is fitted in said linear  
10 guide ring to be movable along said optical axis relative to said linear guide ring without rotating relative to said stationary barrel, and includes an outer ring portion, an inner ring portion, a flange wall by which a front end of said outer ring portion and a front end  
15 of said inner ring portion are connected, and a first cam follower;

a cam ring which is driven to rotate and positioned between said outer ring portion and said inner ring portion;

20 a second lens frame which is fitted in said inner ring portion of said inner ring portion, said second lens frame including a second cam follower;

a third lens frame which is fitted in said second lens frame to be positioned behind said second lens  
25 frame;

a first cam groove formed on an outer peripheral surface of said cam ring so that said first cam follower is engaged in said first cam groove;

5 a second cam groove formed on an inner peripheral surface of said cam ring so that said second cam follower is engaged in said second cam groove; and

a linear guide mechanism, provided between said inner ring portion of said first lens frame and said second lens frame, for guiding said second lens frame  
10 linearly along said optical axis,

wherein said linear guide mechanism comprises:

a linear guide slot formed on said second lens frame to be elongated in said optical axis direction;  
and

15 a linear guide projection which is elongated in said optical axis direction, and projects from an inner peripheral surface of said first lens frame to be engaged in said linear guide slot.